

SECTION 1-7

Variance and Standard Deviation

WARM-UP

Consider the following number of cars sold in seven consecutive weeks.

$$x_1 = 20, x_2 = 16, x_3 = 16, x_4 = 12, x_5 = 18, x_6 = 25, x_7 = 19$$

Calculate each number and tell what it means.

$$\sum_{i=1}^5 x_i$$

$$82$$

$$\sum_{i=1}^7 x_i$$

$$126$$

$$\frac{\sum_{i=1}^7 x_i}{7}$$

$$18$$

Deviation: The difference between a data point and the mean

Variance: The average of the squared deviations

☞ This means you find the deviations, square them, add them up, then divide!

Standard Deviation: The square root of the variance

☞ Tells how far from the mean the scores deviate

CALCULATING VARIANCE AND STANDARD DEVIATION

1. Find \bar{x}
2. Find the deviation (difference) between each value and \bar{x}
3. Find the sum of the squares of the deviations
4. Divide the sum by $n - 1$ (VARIANCE!!!)
5. Square root the variance (STANDARD DEVIATION!!!)

WHAT WE'RE REALLY FINDING

We're actually finding the sample variance and sample deviation. We need to divide by $n - 1$ to take away bias, as we are only looking at a sample of the population.

Sample Variance

$$s^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n - 1}$$

Standard Deviation

$$s = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n - 1}}$$

EXAMPLE 1

Use the frequency chart for days select students were absent.

Days Absent	0	1	2	3	4	6	10
Frequency	2	1	3	1	1	1	1

Find the variance and standard deviation of this data.

First, we will do this by hand, then by graphing calculator.

Population Variance: Checking the variance of the entire population, not just a sample

$$\sigma^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}$$

Population Standard Deviation: The standard deviation for the entire population

$$\sigma = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}}$$

EXAMPLE 2

Find the variance, standard deviation, population variance, and population standard deviation for Matt Mitarnowski's quiz scores.

75 89 83 96 72 77 88 93

$$s^2 \approx 77.268$$

$$\sigma^2 \approx 67.609$$

$$s \approx 8.7902$$

$$\sigma \approx 8.2225$$

HOMEWORK

p. 58 #1 - 23

